

# 3D Printing of the Complete CubeSat

Completed Technology Project (2013 - 2016)



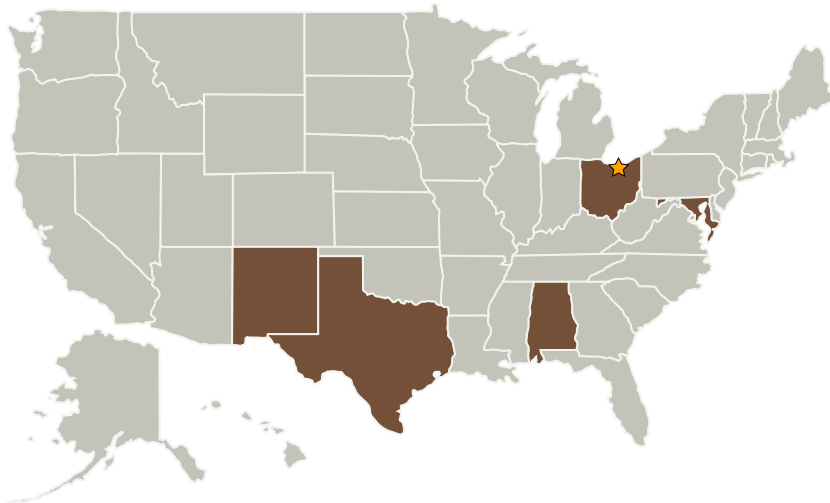
## Project Introduction

The capability to be addressed is related to the enhanced additive manufacturing (popularly referred to as 3D printing) technology for rapid prototyping and manufacturing of small spacecraft. What sets this activity apart from normal 3D printing is that this team embeds wiring and electronic components into the walls of the printed structures. A series of test articles using common and experimental materials will be designed, built and tested for environmental and radiation characterization and protection. The resulting data will provide a best practices guide for choosing different materials to print an entire CubeSat.

## Anticipated Benefits

The primary benefit of this effort is a paradigm change in the manufacturing process of small spacecraft with a print-on-demand capability. These techniques potentially allow the use of new materials with advantages in strength, weight and radiation protection. They also provide significantly reduced expense of spacecraft manufacturing by eliminating re-tooling costs, reducing non-recurring engineering costs and streamlining the space qualification process of new satellites. The results from this work will provide a best practices guide for choosing different materials to print an entire CubeSat including the development of complex integrated components. This work benefits multiple organizations.

## Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
★ Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
J. F. Drake State Community and Technical College	Supporting Organization	Academia	Huntsville, Alabama
Northrop Grumman Systems Corporation	Supporting Organization	Industry	Falls Church, Virginia
The University of Texas at El Paso	Supporting Organization	Academia	El Paso, Texas
University of New Mexico-Main Campus	Supporting Organization	Academia	Albuquerque, New Mexico

Primary U.S. Work Locations	
Alabama	Maryland
New Mexico	Ohio
Texas	

## Project Transitions

 **October 2013:** Project Start

 **April 2016:** Closed out

**Closeout Summary:** Orbital test launched on Super Strypi, designated as ORS-4. Rocket failed to reach orbit. Launched on Super Strypi Rocket with EDSN. Rocket failed to reach orbit

## Project Website:

<https://www.nasa.gov/directorates/spacetech/home/index.html>

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Glenn Research Center (GRC)

**Responsible Program:**

Small Spacecraft Technology

## Project Management

**Program Director:**

Christopher E Baker

**Program Manager:**

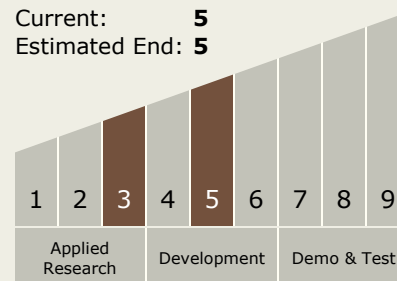
Roger Hunter

**Principal Investigator:**

Craig J Kief

## Technology Maturity (TRL)

Start: **3**  
Current: **5**  
Estimated End: **5**



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## Technology Areas

### Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - └ TX12.4 Manufacturing

## Target Destination

Earth